

Evaluation Framework for the Meteorological Service of Canada Transition

April 2005

***Meteorological Service of
Canada***

Report Clearance Steps

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Acronyms used in the report

AMDAR	Aircraft Meteorological Data Relay
CMC	Canadian Meteorological Centre
DSO	Departmental Service Organization
EC	Environment Canada
EMO	Emergency Measures Organization
FFF	Focusing for the Future
HIW	High Impact Weather
HR	Human Resources
LCM	Life Cycle Management
MSC	Meteorological Service of Canada
NGO	Non-governmental Organization
NL	National Research Laboratories
NSO	National Service Offices
NSU	National Service Unit
OGD	Other Government Department
POR	Public Opinion Research
R&D	Research and Development
RWIS	Road Weather Information System
SPC	Storm Prediction Centres
WPM	Warning Preparedness Meteorologist

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1.0 INTRODUCTION

An evaluation framework for the Meteorological Service of Canada (MSC) Transition was initiated at the request of the Deputy Minister. This framework sets out a plan for the upcoming evaluation scheduled for early 2007-2008. The evaluation framework provides information on what the Transition initiative is expected to achieve and how this will be demonstrated.

The framework begins with a profile which describes the context and rationale behind the Transition and goes on to provide a clear picture of what the Transition is intended to achieve and how this will occur. The profile also includes a description of resource allocations for the initiative. The second component of the framework is a logic model that maps out the Transition initiative and visually represents the linkages between activities and the achievement of outcomes. The third component of the framework is a performance measurement strategy that links with the components of the logic model and describes what needs to be measured, by whom, and how often. The final framework component is the evaluation strategy. This strategy identifies key evaluation questions organized into four areas: relevance, success, cost-effectiveness, and design and delivery. Taken together the evaluation framework will provide a solid basis to ensure that the Transition initiative can provide substantive information on results for the evaluation scheduled for 2007-2008.

2.0 PROFILE

2.1 *Modernization Announcement*

In March 2003, the Government of Canada announced increased funding to revitalize and transform the MSC. As a result of this funding – approximately \$75 million over five years and \$5 million per year thereafter – the MSC will be able to continually upgrade its infrastructure, advance its science and improve its services. This modernization process is directed toward one goal: ensuring the MSC provides the best and most useful weather information and services possible to safeguard the health and safety, security, prosperity and quality of life of Canadians. The funding is intended to allow the MSC, which has been providing weather services to Canadians since 1871, to transition to a modern, sustainable organization that continues to provide quality services to Canadians.

This investment, combined with approximately \$11 million of internal reallocation over the same five-year period and approximately \$2 million annually thereafter, will drive the Transition effort.

Transition is composed of five components, which are described in greater detail later in this document. Essentially, the new Transition funding is intended to: a) modernize Environment Canada's weather forecast operations; b) increase its capacity for outreach to citizens and clients; c) recruit and train staff; d) improve products and services; and e) strengthen its capacity to monitor the environment.

2.2 Impetus for Transition

The MSC has been Canada's weather service for over 130 years. The mandate of the MSC is to enhance public safety and informed decision making by issuing weather warnings; forecasting weather, ice and wave conditions; supporting critical weather-sensitive government services; monitoring atmospheric conditions and predicting the state of the climate; monitoring water levels, and providing scientific research for service improvement and policy advice.

To meet this mandate, the MSC operates one of the most sophisticated weather and hydrometric services in the world, with a \$336.7 million technological infrastructure that operates 24 hours a day, 365 days a year. The reliance on equipment and highly trained staff requires continuing investment in technical and human resources.

The government-wide Program Review of the mid 1990's resulted in a 35% cut to MSC's overall A-base resources (largely capital funding and 900 FTEs). A 1997 Alternate Service Delivery assessment identified chronic underfunding as a source of the MSC's persistent challenge in addressing infrastructure requirements (replacement, upgrading and maintenance of equipment and facilities) and workforce needs (attraction, retention and training of scientists, meteorologists and technologists). The MSC component of the Environment Canada Long Term Capital Plan covering the period 1999-2000 through 2003-2004 identified a total need of \$162 million in incremental capital above the MSC's reference levels to address critical rust out issues. MSC outlined the funds and flexibilities needed to modernize the weather service. In December 1999, the MSC was created as a departmental service organization (DSO) within Environment Canada (EC), replacing the Atmospheric Environment Service, but only limited additional funding for Program Integrity priorities was allocated as a result of this process. For the next several years, while the MSC made plans to "live within its means" ultimately re-cast as "focussing for the future" (FFF), efforts continued to get approval for MSC modernization, along with the investment to implement the modernization plan. These efforts resulted in the Ministerial announcement of March 2003.

2.3 Transition Purpose, Strategy and Benefits

The MSC modernization effort has five elements. All five contribute to one of the Transition's overall goals: a more sustainable organization and infrastructure.

A. Consolidation and Modernization of the MSC's Forecast Operations (\$15.568M and \$0.500M on-going)

A mix of new investment and internal reallocation will be used to consolidate the MSC's existing 14 regional locations into five Storm Prediction Centres (SPCs) – Halifax, Montreal, Toronto, Edmonton and Vancouver, with a component of the Edmonton SPC located in Winnipeg.

Aviation weather services will be consolidated into the Edmonton SPC to serve Western Canada and into the Montreal SPC for Eastern Canada to ensure service levels are maintained at a lower cost and eventually allow for service improvements. Primary

beneficiaries of this consolidation will be the aviation industry, including NAV CANADA and the airlines, but ultimately this move ensures the continued safety of the travelling public.

Increased use of automation and establishment of national standards will increase the efficiency of routine weather forecast production and help maintain overall production effectiveness. The additional establishment of focused National Research Laboratories (NL) co-located with each of the five SPCs will enhance the transfer of scientific knowledge to forecast production operations and thus strengthen linkages between science, forecast production, and service to the public. Each NL will have a specific focus:

- Coastal and mountain meteorology at the Vancouver NL
- Arctic weather and hydrometeorology at the Edmonton NL
- Nowcasting (very short-term weather forecasting) and remote sensing meteorology at the Toronto NL
- Severe weather research at the Montreal NL
- Marine and coastal meteorology at the Halifax NL

The scientific research of the laboratories will benefit not only forecasters across MSC, but also research partners within and outside of Canada.

Forecast office restructuring and the automation of routine tasks will allow more concerted attention to the forecasting of severe weather, thus improving warnings of high impact events that affect all Canadians, levels of government and emergency measures organizations.

Transition funding will be used for the relocation of people and equipment, including any necessary upgrades to facilities; personnel retraining; and improved telecommunications. The relocation and consolidation of facilities and operations will be closely coordinated with Public Works and Government Services Canada.

Additional Transition funding will be allocated to a communications strategy that will adequately support and enhance communication and public relations activities targeted at the public and MSC stakeholders to explain this visible and significant change agenda for the MSC. Significant effort will also be made to communicate and consult with staff and union representatives on an on-going basis on the human resources (HR) changes associated with the Transition.

B. Creation of National Service Offices and Outreach Capacity (\$20.750M and \$4.150M on-going)

A mix of new investment and internal reallocation will be used to establish three National Service Offices (NSOs) in Gander NL, Rimouski QC, and Kelowna BC. Staff from these offices will work with other national and regional MSC staff to better understand Canadians' needs, help in meeting those needs and enhance public understanding and use of MSC's services by working with regional and national stakeholders and with the five National Research Laboratories and Storm Prediction Centres. The offices will also support the MSC's outreach activities.

Each NSO will have an area of specialization: Gander for marine services; Rimouski for media services; and Kelowna for road weather and weather-sensitive sector services. Additional outreach capacity will be made available in Regina, in support of the needs of the national

agricultural community. Outreach staff will also be located at each of the Storm Prediction Centres and other sites across the country.

The specific focus of the NSOs will help MSC to target the specialized needs and relationships of clients such as the marine community, the media, provincial, territorial, and municipal transportation agencies and road maintainers, and the agricultural sector. The outreach network will also result in better understanding and use of MSC's products and services by all users – the general public, the media, emergency measures organizations, etc., and thus help improve Canadians' ability to make informed decisions to protect themselves and their property and to maximize the economic benefits of weather and climate information.

C. Restoring and Developing Key Skill Sets (\$11.660M)

A mix of new investment and internal reallocation will be used to restore and develop key skill sets across the country to address pending demographic gaps in technical and scientific areas of expertise. This is designed to ensure continuity and enhancement of knowledge, skills and capacity as the MSC goes through a major turnover in staff as a result of the retirement of a large cohort of specialists in the next few years. Funding for this component will initially be provided through this investment and replaced with funding through internal re-allocation, starting in 2006-2007.

One of the fundamental objectives of the restructuring of operations is to ensure that sufficient resources continue to be available for the recruitment and training of both scientific and technical staff (Meteorologist (MT) and Engineering and Scientific Support (EG) classification).

This investment will ensure that the MSC has the people with the necessary skills for the next several years, that Canadians will continue to be provided with high quality products and services, and that the MSC maintains effective staff succession as the demographic profile of the MSC's human resource base undergoes a fundamental changeover.

D. Introducing Product and Service Enhancements and Innovation (\$11.600M and \$2.100M on-going)

The new investment funds will allow the MSC to respond to some of the key needs expressed by Canadians through MSC's 2002 national survey, including safer winter roads through the implementation of road weather observational networks and related services; improved seasonal and extended range forecasts, targeted specifically at weather-sensitive private and public sector activities; and development and provision of information needed to improve the understanding of societal vulnerabilities to severe weather and associated community responses. These product and service enhancements will benefit a wide range of users, both in the private and public sector. The improved understanding of societal vulnerability will assist the public, governments, and emergency measures organizations to better prepare and adapt to high impact weather events.

E. Invigorating the MSC's Monitoring Capacity (\$25.472M and \$0.500M on-going)

The new investment will be used to invigorate the MSC's monitoring capacity, through the rationalization and modernization of the MSC's monitoring systems (including the remediation of decommissioned observing sites which may present a public safety liability); through the establishment of Life Cycle Management (LCM) approaches to facilitate the on-going

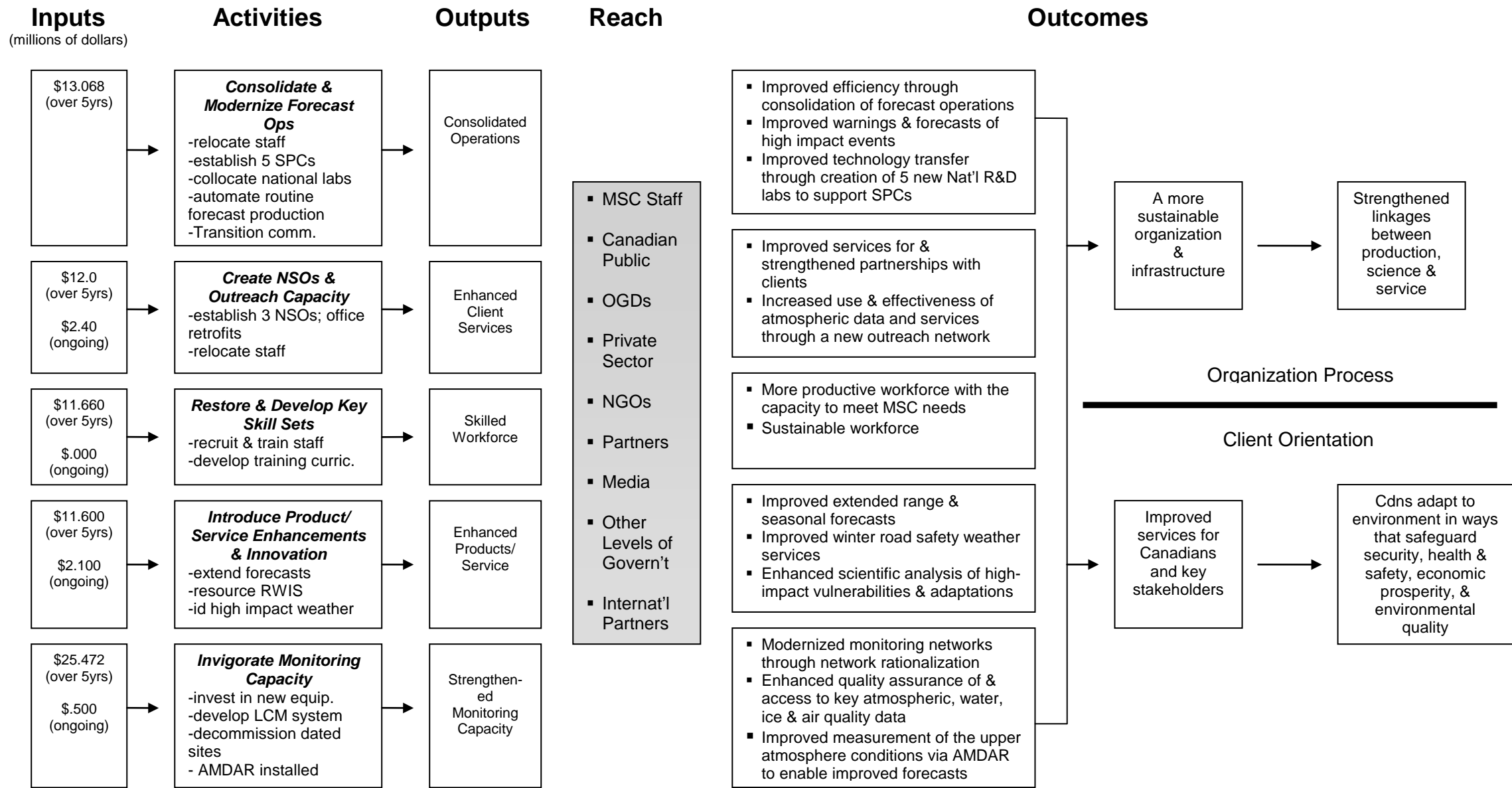
maintenance and repair of operational field equipment; through enhanced quality assurance and data access systems for the storage of key data used by the MSC's products and services; and through the enhancement and continued operation of the AMDAR system (Aircraft Meteorological Data Relay, which is an aircraft-borne weather sensor system), which will provide new and enhanced measurement of the upper atmosphere and thereby enable improvements in the quality of forecasts and warnings, which ultimately benefit citizens and clients.

The monitoring system is the foundation of all MSC's products and services, and maintaining and improving it is critical to all operations. The environment, MSC staff, and the public will benefit from the clean up of contaminated sites. Data quality control and access improvements will ensure reliable, high quality weather, climate and water quantity data, which contributes to provincial, national and global data sharing networks and feeds scientific research in Canada and internationally.

2.4 Resource Allocations by Component

Summary of Initiatives (Million dollars)	5-Year Investment			On-going Investment		
	Requested	Reallocated	Total	Requested	Reallocated	Total
A. Consolidation and Modernization of the MSC's Forecast Operations						
Consolidation of Weather Forecast Production Capabilities	10.178	2.500	12.678	0.000	0.500	0.500
Automated Routine Forecast Production	1.900	0.000	1.900	0.000	0.000	0.000
Communicating Program Consolidation to Clients, the Public and Staff	0.990	0.000	0.990	0.000	0.000	0.000
Sub-total A	13.068	2.500	15.568	0.000	0.500	0.500
Creation of National Service Offices and Outreach Capacity						
Sub-total B	12.000	8.750	20.750	2.400	1.750	4.150
C. Restoring and Developing Key Skill Sets						
Sub-total C	11.660	0.000	11.660	0.000	0.000	0.000
Introducing Product and Service Enhancements and Innovation						
Extended Range and Seasonal Forecasts	5.000	0.000	5.000	1.000	0.000	1.000
Road Weather Information System	5.500	0.000	5.500	0.600	0.000	0.600
High Impact Weather and Climate Vulnerabilities and Response Strategies	1.100	0.000	1.100	0.500	0.000	0.500
Sub-total D	11.600	0.000	11.600	2.100	0.000	2.100
E. Invigorating the MSC's Monitoring Capacity						
Rationalizing the Monitoring System	17.110	0.000	17.110	0.000	0.000	0.000
Assuring Data Quality and Access	6.962	0.000	6.962	0.000	0.000	0.000
Aircraft-Based Atmospheric Sensing System (AMDAR)	1.400	0.000	1.400	0.500	0.000	0.500
Sub-total E	25.472	0.000	25.472	0.500	0.000	0.500
Total Investment Strategy	73.800	11.250	85.050	5.000	2.250	7.250

3.0 LOGIC MODEL



4.0 PERFORMANCE MEASUREMENT STRATEGY

Element	Performance Measure	\$ Planned (millions)	\$ Spent (millions)	Data Source	Collection Frequency	Accountable Manager
Outputs						
Consolidated Operations						
▪ 5 SPCs established & staff relocated	<ul style="list-style-type: none"> ▪ % of affected staff relocated ▪ # of staff laid off ▪ SPCs established 	10.178		Transition reports	One time	AEPDG and RDs
▪ National labs collocated	▪ National Labs in place			Transition reports	One time	ACSDG and RDs
▪ Automated routine forecast production	▪ Automated Routine Forecast production operational/ SCRIBE implemented	1.9		Transition reports Forecast verification statistics from SPC reports	One time	AEPDG
▪ Transition communication	▪ Communication strategy (internal/ external)	.99		Communication reports	One time	Communications Director
Enhanced Client Services						
<ul style="list-style-type: none"> ▪ 3 NSOs & 1 NSU; offices retrofitted and established ▪ Staff relocated 	<ul style="list-style-type: none"> ▪ NSOs/NSU operational ▪ % of positions staffed ▪ % of affected staff relocated 	12.0		Transition reports NSO reports-once established	One time	SCPDG and RDs
Skilled Workforce						
▪ Staff recruited & trained	▪ # of new staff recruited, including # of Scientific, Training and Technology Transfer staff hired	11.660		Training Reports from organizations Employee survey	Annually	All
▪ Training curriculum developed/ implemented	▪ Curriculum completed/ delivered			National Directors General Executive Perf. Agreements	One time	National Directors Generals

Enhanced Products/Services						
<ul style="list-style-type: none">Extended forecasts	<ul style="list-style-type: none">Probabilistic and scenario type longer term forecasts from weeks to seasons developedGeneral seasonal forecasts issued monthly instead of every three monthsDaily forecasts extended out to seven daysDaily outlooks issued for the second weekAccuracy of forecasts	5.0		Transition reports Annual report SPC reports Forecast verification statistics	One Time (when operations start)	ACSDG/AEP DG
<ul style="list-style-type: none">RWIS resourced	<ul style="list-style-type: none"># of networks established# of provincial agreements# of accidents related to winter road conditions	5.5		Internal reports/Agreements Provincial reports	Annually	SCPDG
<ul style="list-style-type: none">High impact weather vulnerabilities, impacts, and adaptation actions identified	<ul style="list-style-type: none"># of scientific analyses are conducted on the nature and characteristics of HIWCriteria and standards established for HIW outreach/response	1.10		Reports from WPMs, Outreach and NSO staff Verification statistics	Annually	SCPDG, RDs
Strengthened Monitoring Capacity						
<ul style="list-style-type: none">Rationalizing the monitoring system - new equipment purchased and old sites decommissioned	<ul style="list-style-type: none">Planned equipment is acquired# and % of sites decommissioned	17.110		Life Cycle Management records Transition reports	Annual	AMWSDG RDs
<ul style="list-style-type: none">LCM support system developedData Quality and Access	<ul style="list-style-type: none">LCM documentation	6.962		Life Cycle Management records	One time	AMWSDG

				Data Management Framework project report on data		
▪ AMDAR	▪ # of AMDAR systems installed on commercial airplanes	1.4				AMWSDG
Immediate Outcomes	Performance Measures		Data Source	Collection Frequency	Accountable Manager	
Improved efficiency through consolidation of forecast operations	▪ Operating costs compared to 04/05 'FFF' budgets		Budget info/Transition reports	Annual	AEPDG and RDs	
Improved warnings & forecasts of high impact events	<ul style="list-style-type: none"> ▪ Accuracy of public forecasts ▪ Accuracy of severe weather warnings ▪ Timeliness of severe weather warnings 		MSC Forecast & Warning Verification System	Ongoing, as required	SCPDG and RDs AEPDG	
Improved technology transfer through creation of Nat'l R&D labs to support SPCs	<ul style="list-style-type: none"> ▪ # of labs opened ▪ Staffing and technology transfer process for R&D developed ▪ Peer review on effectiveness of technology transfer 		Transition reports Peer review report	One time Annually One time	ACSDG AEPDG RDs PCADG	
Improved services for & strengthened partnerships with clients	<ul style="list-style-type: none"> ▪ Satisfaction of targeted sectors ▪ # of WPM and outreach positions staffed 		Future POR Transition Reports	Periodic surveys of various client sectors One time	SCPDG/RDs	
Increased use & effectiveness of atmospheric data and services through a new outreach network	<ul style="list-style-type: none"> ▪ Satisfaction of targeted clients and the Public ▪ # of new requests for data of all kinds (weather office, gridded binary, archive, etc.,) 		Future POR Statistical reports from web, Automatic Telephone Answering Devices, other data sources	Baseline data exists -Periodic surveys of various client sectors Annually	SCPDG/RDs	
More productive workforce with the capacity to meet MSC needs	<ul style="list-style-type: none"> ▪ Demographic profiles of key employee groups ▪ Satisfaction of staff with Transition HR process/and training availability 		HRMIS Transition survey	Annually Baseline data exists; survey staff annually	All ACSDG, AEPDG, AMWSDG, RDs	

Sustainable workforce	<ul style="list-style-type: none"> Demographic profiles of key employee groups (staff and retirement plans) 	HR data	Annually	All
Improved extended range & seasonal forecasts	<ul style="list-style-type: none"> Accuracy of seasonal long term forecasts 	CMC	Seasonally	AEPDG/ACSDG
Improved winter road safety weather services (note in narrative evaluation that we are not responsible for final result)	<ul style="list-style-type: none"> Road management practices adjusted Satisfaction of road management staff with MSC products and services 	Sector specific focus groups/surveys	Annually	SCPDG
Enhanced scientific analysis of high-impact vulnerabilities & adaptations	<ul style="list-style-type: none"> # of scientific analyses in Human health, economic, environmental and infrastructure risks and vulnerabilities identified 	Peer reviewed scientific publications Anecdotal reports/ feedback and POR from EMO and municipal partners	Annually	ACSDG, RDs
Modernized monitoring networks through network rationalization	<ul style="list-style-type: none"> % of completed upgrades or decommissioning 	Life cycle management records	Annually	AMWSDG
Enhanced quality assurance of & access to key atmospheric, water, ice & air quality data	<ul style="list-style-type: none"> % of time data networks & archives are available (access) Quality of information in data networks & archives 	Monitoring stats/ tracing	Annually or ongoing	AMWSDG
Improved measurement of the upper atmosphere conditions via AMDAR to enable improved forecasts	<ul style="list-style-type: none"> Effective ingestion of the new data stream into models 	Transition report	Annually	AMWSDG

Intermediate/ Final Outcomes	Performance Measures	Data Source	Collection Frequency	Accountable Manager
A more sustainable organization & infrastructure	<ul style="list-style-type: none"> Life Cycle approach to management (equip., people, finances) 	Dept. People Strategy Dept. LCM/Long-term capital plan Resource envelope	Annual	All
Strengthened linkages between production, science & service	<ul style="list-style-type: none"> Demonstrated transfer of science to operations 	Key informant interviews (with science/production/service) National Labs' Annual Reports International Peer Review	Annual One time	ACSDG, AEPDG, SCPDG, regions PCAD?
Improved services for Canadians and key stakeholders	<ul style="list-style-type: none"> Client satisfaction results (public and other sectors) including timeliness, utility, etc. Quality, type, and range of services delivered (reach through various technologies) 	POR Report on products	Periodic surveys of various client sectors Annually	SCPDG, regions, PCADG
Canadians adapt to environment in ways that safeguard security, health & safety, economic prosperity & environmental quality	<ul style="list-style-type: none"> Public awareness of vulnerability Change in behaviour to take adaptive action based on information (forecasts, warnings and other info) – for both public and businesses Governments implement policies that enable adaptation 	POR (have some baseline info for public) Either POR or case studies Government policies	Periodic surveys of various client sectors Ongoing	All

5.0 EVALUATION STRATEGY

Evaluation Issue	Evaluation Question	Potential Indicator(s)	Data Source
Relevance – does the initiative continue to be consistent with organizational priorities and address actual needs?	<ul style="list-style-type: none"> Is the Transition still aligned with MSC, EC, and government priorities? Did the Transition address the needs identified by MSC to realign their function? How has Transition adapted to departmental re-organization? 	<ul style="list-style-type: none"> Extent to which the strategic directions documented in the Transition match that of MSC, EC, and government priorities Documented impacts Positive/negative impacts of Transition changes, as identified by management, staff, other stakeholders 	<ul style="list-style-type: none"> Transition reports Management, staff, public surveys Expert interviews
Success – is the initiative meeting its intended outcomes, within budget and without negative outcomes?	<ul style="list-style-type: none"> To what extent has the Transition progressed toward its outcomes? What were the barriers to success? Have linkages been made between production science and service? Were there any unintended impacts of Transition? To what extent are various stakeholders satisfied with Transition? Has management made appropriate use of ongoing performance information? 	<ul style="list-style-type: none"> As indicated in the performance measurement strategy Extent to which Transition has resulted in positive/negative unintended impacts Satisfaction among stakeholders Extent to which performance measurement system developed for this framework has been implemented. Extent to which performance information is used to manage and adjust. 	<ul style="list-style-type: none"> Surveys/ interviews of staff and stakeholders Case Studies Performance measures Use of performance measurement in decision making
Cost Effectiveness – are the most appropriate and efficient means being used to achieve outcomes?	<ul style="list-style-type: none"> Are there any more cost-effective ways of achieving the stated outcomes of Transition? Was the Transition completed within its budget/timeline? 	<ul style="list-style-type: none"> Extent to which Transition budget is appropriate in consideration of the stated objectives Identified suggestions for improvement which made the Transition more cost-effective Financial breakdowns for each component of the Transition 	<ul style="list-style-type: none"> Transition financial reports Staff/ management interviews Peer review (production) World Meteorological Organization standards & guidelines

<p>Design & Delivery – is the initiative being delivered in the best possible way; are these the correct set of activities/outputs to achieve goals?</p>	<ul style="list-style-type: none"> ▪ Was the path put forward by the Transition the best way to achieve the desired outcomes? ▪ Have new/improved ways been identified to meet the Transition goal (i.e internal adjustments over the 5 year course of Transition)? 	<ul style="list-style-type: none"> ▪ Activities and outputs identified in the logic model are validated ▪ Stakeholder feedback 	<ul style="list-style-type: none"> ▪ Measuring delivery of outcomes (technical measures as well as POR & qualitative measures such as an international peer review / case studies) ▪ Stakeholder/ staff/ management surveys ▪ Expert interviews ▪ Peer review (production) ▪ World Meteorological Organization standards & guidelines
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